
Fleet sizing and cyclic delivery scheduling for in-plant inventory routing

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Abstract

In assembly lines, materials are supplied to workstations from an in-plant warehouse known as the supermarket. The delivery process is done with vehicles known as tow trains, and wagons attached to them. Determining the number of tow trains, number of wagons attached to each train, amount of materials to be delivered to each station by which train, and scheduling and routing the trains are decisions continuously made in production plants. Avoiding congestion is a major concern in these decisions.

The in-plant inventory routing problem considers finding delivery routes and schedules of tow trains with minimum cost. Our objective is to determine the minimum cost fleet size, cyclic delivery routes and schedules, while preventing material stockouts at workstations and avoiding congestion under deterministic demand.

In this study, we develop an integer linear programming model to determine the fleet size, and to design the routes and schedules of the trains. Due to the complexity of the problem, we introduce heuristics to find good quality solutions. We test the effectiveness of our algorithms on randomly generated test instances.

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